REMARKS

In the Office Action, the disposition of the claims was as follows:

- Claims 22-41 were allowed;
- Claims 1, 5, 10, 11, 13-15, 17 and 18 were rejected as being anticipated under 35 U.S.C. § 102(e) by Rowe et al., "Map Construction For Mosaic Based Vehicle Position Estimation;" and
- Claims 2-4, 6-9, 12, 16, 17, 19-21 were objected as being dependent upon a rejected base claim but otherwise allowable if rewritten in independent form to including the limitations of their respective base claim and any intervening claims.

For the reasons set forth below, the Rowe paper does not anticipate claims 1, 5, 10, 11, 13-15, 17 and 18 as originally filed. Therefore, Applicants request that the rejections be withdrawn and that each of original claims 1-41 should be allowed.

Section 102 Rejection based on the Rowe Paper

At the outset, the Rowe paper cannot form the basis for a rejection under 35 U.S.C. § 102(e), as stated in the Office Action, because it is not a published U.S. patent application or a granted U.S. patent, as is required by § 102(e). For this reason alone, the rejection stated in the Office Action based on Rowe should be withdrawn. Notwithstanding, the Rowe paper does not disclose all of the elements of claims 1, 5, 10, 11, 13-15, 17 and 18 and, therefore, the Rowe paper does not anticipate these claims under either § 102(a) or § 102(b) even if Rowe qualifies as prior art under one of these sub-sections.

Claim 1 of the present application is directed to a computer-assisted method of localizing a rack. In general, the method includes capturing images of the surrounding environment to

sense the rack in a captured image. Line segments in the sensed image of the rack are detected and a candidate arrangement of line segments indicative of a predetermined feature of the rack (such as holes for inserting the forks of a forklift) is recognized. Then, a matrix of correspondence between the candidate arrangement of line segments and an expected position and orientation of the predetermined feature of the rack is generated and, based on the matrix of correspondence, the position and orientation (pose) of the rack is estimated.

In contrast, the Rowe paper is directed to a position estimation technique for a mobile vehicle that uses a ***downward***-looking camera system for capturing images of the surface that the vehicle travels over. The captured images of the surface are compared to previously stored images of the surface to generate an estimate of position. Being a downward–looking vision system, the Rowe system is not designed to localize racks that may be scattered throughout the 3D environment of the mobile vehicle, but rather is designed to estimate pose based on a 2D scene (the floor). Because of this fundamental difference, the Rowe paper fails to disclose several features of claim 1, including the following:

First, the Rower paper fails to show the step of sensing an image of the rack to be localized. In contrast, the Rowe system discloses looking ***downward*** at a surface to estimate position. Figure 1 of the Rowe paper also does not show the step of sensing an image of the rack to be localized, as suggested in the Office Action. Instead, Figure 1 shows the mapping rig that contains the downward-looking vision system.

Second, the Rowe paper fails to show the step of detecting line segments in the sensed image. The map segments mentioned in paragraph 4 of the Rowe paper do not correspond to line segments in a sensed image, in contrast to the suggestion in the Office Action. In Rowe, the map is considered to be a graph-like structure whose edges are the map segments. See Rowe, ¶

4.1. In contrast, in claim 1, the line segments (or edges) that are sensed in the image are areas of the image where color and/or intensity in the image change rapidly, i.e., discontinuities in the image. See application at p. 8, lines 6-7. Thus, in the present application the term "line segments" is used in a computer-vision sense, and in the Rowe paper the term "map segments" is used in a completely nonanalogous graph-theory sense.

Third, the Rowe paper does not disclose the step of recognizing a candidate arrangement of line segments indicative of a predetermined feature of the rack. In fact, since the Rowe paper does not discuss racks or line segments, it cannot disclose this step. Moreover, nothing in paragraph 4.1 of Rowe, cited in the Office Action, discloses or suggests this step.

Fourth, the Rowe paper does not disclose the step of generating a matrix of correspondence between the candidate arrangement of line segments and the expected pose of the predetermined feature of the rack. The Office Action cites paragraph 4.1.1 as disclosing this step, but the operator matrix discussed in this paragraph has nothing to do with a correspondence matrix. Instead, the operator matrix is used to transform coordinates in order to rigidly move map segments from one place to another.

Fifth, the Rowe paper does not disclose estimating the pose of the rack based on the matrix of correspondence. Indeed, since Rowe does not disclose the step of generating a matrix of correspondence, it cannot show the step of estimating pose based on the matrix.

For at least these reasons, Rowe does not anticipate claim 1. In addition, for analogous reasons, Rowe does not anticipate claims 5, 10, 11, 13-15, 17 and 18. Therefore, the § 102 rejections based on Rowe should be withdrawn.

CONCLUSION

In view of the above, Applicants respectfully request withdrawal of the rejections and allowance of the claims. If the Examiner is of the opinion that the instant application is in condition for disposition other than allowance, the Examiner is respectfully requested to the undersigned attorney at the telephone number listed below in order that the Examiner's concerns may be expeditiously addressed.

Respectfully submitted,

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